

## ON TIME STEAM QUALITY, TEMPERATURE, AND PRESSURE MEASURING METHOD AND APPARATUS AT THE HEAD OF AN INJECTION WELL

### ABSTRACT

The present invention is a method and an apparatus for the purpose of monitoring steam quality, temperature, and pressure, all located at the head of an injection well; steam along with high temperature and pressure are applied towards extraction of dense oil. The space index of refraction, representing the status of the mixture ratio in regards to steam and water, determines steam quality; a fiber optic method is employed for the above-mentioned task. Sensors, in the optical fiber, possess capabilities to also measure the temperature and pressure status throughout the fluid. Continually operating in all weather conditions, without flow obstruction, the sensors directly contact the steam; high temperature and pressure ratio determination would be the resulting outcome. Signals temperature  $t$ , pressure  $p$ , steam quality  $\rho$ , are captured by the optical fiber sensors; the above referenced signals are subjected to opto-electric exchange and amplification prior to transmission by means of a cable, to a nearby control site. Once data reaches the control site, a computer, previously set up, can control an on-time release system. To achieve transmission by a satellite, an antenna installation, in connection to the computer, becomes an additional option. In a centralized injection case, only one apparatus will be required in a specific well; in a dispersed injection case, each well will require an apparatus. The method invented offers numerous advantages, a compact structure, low cost, and a level of high accuracy in regards to measurements.

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